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| EXAMINER |
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TIMORY, KABIR A

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2611

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10/01/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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|------------------------------|--------------------------------------|-------------------------------------|--|
| Office Action Summary | Application No. 10/779,677 | Applicant(s) JEONG ET AL. | |
| | Examiner KABIR A. TIMORY | Art Unit 2611 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 June 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 13-23 is/are rejected.
- 7) ☒ Claim(s) 10-12 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This office action is in response to the amendment filed on 06/30/2008. Claims 1-23 are pending in this application and have been considered below.
2. Applicant's arguments with respect to claims 1-23 have been considered but are moot in view of new ground(s) of rejection.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 1-9, 13-17 and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Izzard et al (US 5,506,874) in view of Laturell et al. (US 20040096013).**

Regarding claim 1:

As shown in figure 1-11, Izzard et al discloses a quarter-rate phase detector comprising:

Art Unit: 2611

- an error circuit (20, 22 in figure 1) to combine corresponding ones of the latched signals respectively, resulting in a plurality of intermediate signals (column 1, lines 36-39); and
- a multiplexing unit (24 in figure 1) to selectively output the intermediate signals as a phase error signal (PI in figure 1).

Izzard et al. discloses all of the subject matter as described above and four latches except for specifically teaching four latches controllable to latch, at different times according to quadrature clock signals respectively, data received by the quarter-rate phase detector so as to form latched signals.

However, Laturell et al. in the same field of endeavor, teaches four latches controllable (figure 3 clearly shows that the 4 latches 314, 316, 318, and 320 are controllable by the I and Q (quadrature) clock signal) to latch (314, 316, 318, and 320 in figure 3), at different times according to quadrature clock signals (CLK2I, CLK2Q, CLK2IB, AND CLK2QB in figure 3) respectively, data received (112 in figures 2 and 3) by the quarter-rate phase detector (par 0002, lines 1-5) so as to form latched signals (OD1-OD4 in figure 3) (par 0026, lines 7-16, par 0033, lines 1-5, par 0040-par 0048). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use a quadrature phase detector which contains four latches as taught by Laturell et al. to modify the system and method of Izzard et al. in order to optimize the clock recovery circuitry by centering the latch function over the time of highest signal level, thereby maximizing signal-to-noise ratio (see par 0008).

Regarding claim 2:

Art Unit: 2611

Izzard et al. discloses all of the subject matter as described above except for specifically teaching wherein:

- the quadrature clock signals include signals I, Q, Ib and Qb;
- a first one of the latches is controlled by I;
- a second one of the latches is controlled by Q;
- a third one of the latches controlled by Ib; and
- a fourth one of the latches is controlled by Qb.

However, Laturell et al. in the same field of endeavor, teaches wherein:

- the quadrature clock signals include signals I, Q, Ib and Qb (see figure 3);
- a first one of the latches is controlled by I (see the clock signal for 320 in figure 3);
- a second one of the latches is controlled by Q (see the clock signal for 314 in figure 3);
- a third one of the latches controlled by Ib (see the clock signal for 316 in figure 3);
- and
- a fourth one of the latches is controlled by Qb (see the clock signal for 318 in figure 3).

Although, the order of the four quadrature signals are different, it would have been obvious to one ordinary skill in the art at the time the invention was made to rearrange the order of the clock signal for the four latches as taught by Laturell et al. to modify the system and method of Izzard et al. in order to optimize the clock recovery circuitry by centering the latch function over the time of highest signal level, thereby maximizing signal-to-noise ratio (see par 0008).

Regarding claim 3:

Izzard et al. further discloses wherein the multiplexing unit is controllable by the quadrature clock signals (figure 9, 24).

Regarding claim 4:

Izzard et al. further discloses wherein the multiplexing unit is controllable to truncate the intermediate signals (figure 1, MI' and MI").

Regarding claim 5:

Izzard et al. further discloses wherein the multiplexing unit is operable to form the phase error signal by cycling through the truncated intermediate signals (figure 1, MI' and MI", column 3, lines 5-19).

Regarding claim 6:

Izzard et al. further discloses wherein the quadrature clock signals include signals I and Q; and the multiplexing unit is controlled according to the signals I and Q, respectively (figure 1, MI' and MI", column 3, lines 5-19).

Regarding claim 7:

Izzard et al. further discloses wherein the multiplexing unit includes:

- a first multiplexer and a second multiplexer to receive the intermediate signals, respectively (figure 9, 28, 32); and
- a third multiplexer to multiplex outputs of the first and second multiplexers (figure 9, 24).

Regarding claim 8:

Izzard et al. further discloses wherein

Art Unit: 2611

- the corresponding latched signals are pairs of latched signals (figure 9 MI' and MI"); and
- each pair has a first set and a second set, the second set representing the latched signals subsequently closest in time to the first set, respectively (figure 9 MI' and MI", column 3, lines 14-19).

Regarding claim 9:

Izzard et al. further discloses wherein the error circuit includes four exclusive OR (XOR) gates, each XOR gate receiving one of the pairs, respectively (figure 9, 20, 22, 26, 30).

Regarding claim 13:

Izzard et al. further discloses wherein the rate of the intermediate signals is 1/4 of the received data rate (column 5, lines 31-32).

Regarding claim 14:

As shown in figure 1-11, Izzard et al discloses a quarter-rate phase detector comprising:
an error signal-generating circuit to generate a phase error signal based upon the four latched signals and the quadrature clocks signals (figure 9, MI').

Izzard et al. discloses all of the subject matter as described above except for specifically teaching four data latches, each latch receiving the same input, respectively, so as to produce latched signals.

However, Laturell et al. in the same field of endeavor, teaches four data latches (314, 316, 318, and 320 in figure 3), each latch receiving the same input (112 in figure

Art Unit: 2611

3), respectively, so as to produce latched signals (OD1-OD4 in figure 3) (par 0026, lines 7-16, par 0033, lines 1-5, par 0040-par 0048). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use a quadrature phase detector which contains four latches as taught by Laturell et al. to modify the system and method of Izzard et al. in order to optimize the clock recovery circuitry by centering the latch function over the time of highest signal level, thereby maximizing signal-to-noise ratio (see par 0008).

Regarding claim 15:

Izzard et al. discloses all of the subject matter as described above except for specifically teaching the error-signal-generating circuit is operable upon the four latched signals and is controlled by the quadrature clocks signals.

However, Laturell et al. in the same field of endeavor, teaches the error-signal-generating circuit is operable upon the four latched signals (OD1-OD4 in figure 3) and is controlled by the quadrature clocks signals (CLK2I, CLK2Q, CLK2IB, AND CLK2QB in figure 3) (par 0026, lines 7-16, par 0033, lines 1-5, par 0040-par 0048). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use a quadrature phase detector which contains four latches as taught by Laturell et al. to modify the system and method of Izzard et al. in order to optimize the clock recovery circuitry by centering the latch function over the time of highest signal level, thereby maximizing signal-to-noise ratio (see par 0008).

Regarding claim 16:

Art Unit: 2611

As shown in figure 1-11, Izzard et al discloses a quarter-rate phase detector comprising:

- four XOR gates receiving latched signals (figure 9, 20, 22, 26, 30), respectively, each XOR gate generating an intermediate signal (figure 9, MI' and MI'');
- a multiplexer to selectively output one of the four intermediate signals as a phase error signal (figure 9, 24).

Izzard et al. discloses all of the subject matter as described above and four latches except for specifically teaching each latched signal corresponding to input data latched according to one of quadrature clock signals.

However, Laturell et al. in the same field of endeavor, teaches each latched signal corresponding to input data latched (112 in figure 3) according to one of quadrature clock signals (CLK2I, CLK2Q, CLK2IB, AND CLK2QB in figure 3) (par 0026, lines 7-16, par 0033, lines 1-5, par 0040-par 0048). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use a quadrature phase detector which contains four latches as taught by Laturell et al. to modify the system and method of Izzard et al. in order to optimize the clock recovery circuitry by centering the latch function over the time of highest signal level, thereby maximizing signal-to-noise ratio (see par 0008).

Regarding claim 17:

Izzard et al. discloses all of the subject matter as described above except for specifically teaching four data latches, each latch receiving the same input data, the

Art Unit: 2611

latches being clocked by quadrature clock signals, respectively, so as to produce quadrature latched data signals.

However, Laturell et al. in the same field of endeavor, teaches four data latches (314, 316, 318, and 320 in figure 3), each latch receiving the same input data (112 in figure 3), the latches being clocked by quadrature clock signals (CLK2I, CLK2Q, CLK2IB, AND CLK2QB in figure 3), respectively, so as to produce quadrature latched data signals (OD1-OD4 in figure 3) (par 0026, lines 7-16, par 0033, lines 1-5, par 0040-par 0048). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use a quadrature phase detector which contains four latches as taught by Laturell et al. to modify the system and method of Izzard et al. in order to optimize the clock recovery circuitry by centering the latch function over the time of highest signal level, thereby maximizing signal-to-noise ratio (see par 0008).

Regarding claim 21:

As shown in figure 1-11, Izzard et al discloses a method of detecting phase at a quarter of the rate of the received data, the method comprising:

- combining corresponding ones of the latched signals, respectively, to provide a plurality of intermediate signals (figure 9, MI' & MI''); and
- selectively outputting one among the intermediate signals, respectively, to provide a constructed a phase error signal (figure 9, 24).

Izzard et al. discloses all of the subject matter as described above and four latches except for specifically teaching latching, at different times according to quadrature clock signals, respectively, the received data so as to form latched signals.

Art Unit: 2611

However, Laturell et al. in the same field of endeavor, teaches latching (314, 316, 318, and 320 in figure 3), at different times according to quadrature clock signals (CLK2I, CLK2Q, CLK2IB, AND CLK2QB in figure 3), respectively, the received data (112 in figure 3) so as to form latched signals (OD1-OD4 in figure 3) (par 0026, lines 7-16, par 0033, lines 1-5, par 0040-par 0048). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use a quadrature phase detector which contains four latches as taught by Laturell et al. to modify the system and method of Izzard et al. in order to optimize the clock recovery circuitry by centering the latch function over the time of highest signal level, thereby maximizing signal-to-noise ratio (see par 0008).

Regarding claim 22:

Izzard et al. further discloses wherein:

- the quadrature clock signals include signals I and Q; and the selectively outputting step selectively outputs according to the signals I and Q, respectively (column 2, lines 43-48).

Regarding claim 23:

Izzard et al. further discloses wherein the rate of the quadrature clock signals is 1/4 of the received data rate (column 5, lines 31-32).

5. Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Izzard et al. in view of Savoj et al. (US 6,847,789).

Art Unit: 2611

Regarding claim 18:

As shown in figure 11, Izzard et al discloses a clock and data recovery (CDR) circuit comprising:

- a phase-error generating circuit to determine quarter-rate phase detector (figure 11, 10, column 2, lines 43-45);
- a filter operable upon an output of the charge pump; and
- a quadrature voltage-controlled oscillator (VCO) operable upon an output of the filter;
- the phase-detector being controllable by the output of the VCO.

Izzard et al discloses all of the subject matter as described above except for specifically teaching a charge pump operable upon an output of the phase detector.

However Savoj et al. in the same field of endeavor, teaches a charge pump operable upon an output of the phase detector (figure 2, 220,).

One of ordinary skill in the art would have clearly recognized that a phase lock loop (PLL) and clock and data recovery (CDR) circuit are generally include a phase detector to generate a voltage signal which represents the difference in phase between two signal input, a charge pump to generate either higher or lower voltage power source for the LPF and VCO using capacitors as storage elements, a low-pass filter (LPF) to attenuate frequencies that are higher than the cutoff frequency, and a voltage controlled oscillator (VCO) to be controlled in oscillation frequency oscillation by a voltage input. To generate the desired voltage power, it would have been obvious to one ordinary skill in the art at the time the invention was made to include a charge pump when designing

Art Unit: 2611

a (PLL) and (CDR) circuits as taught by Savoj et al. Including a charge pump in the CDR circuit would facilitate the operation of PLL and CDR circuit by providing the higher voltage from a low voltage inputs.

Regarding claim 19:

Izzard et al. further discloses, the CDR circuit of claim 18, wherein the rate of the quadrature signals of VCO is 1/4 of the received data rate of the phase-error generating circuit (column 5, lines 31-32).

6. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Izzard et al. in view of Savoj et al. (US 6,847,789) as applied to claim 18 and further in view of Laturell et al.

Regarding claim 20:

Izzard et al. further discloses, the CDR circuit of claim 18, wherein

- the phase-error-generating circuit includes:
- an error circuit to combine corresponding ones of the latched signals respectively (figure 9, MI'), the error circuit providing a plurality of intermediate signals (figure 9, MI' & MI''); and
- a multiplexing unit to selectively output the intermediate signals as a phase error signal (figure 9, 24).

Izzard et al. and Savoj et al. disclose all of the subject matter as described above except for specifically teaching latching four latches controllable to latch, at different

Art Unit: 2611

times according to quadrature clock signals, respectively, data received by the phase detector so as to form latched signals.

However, Laturell et al. in the same field of endeavor, teaches four latches controllable to latch (314, 316, 318, and 320 in figure 3), at different times according to quadrature clock signals (CLK2I, CLK2Q, CLK2IB, AND CLK2QB in figure 3), respectively, data received by the phase detector so as to form latched signals (par 0026, lines 7-16, par 0033, lines 1-5, par 0040-par 0048). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use a quadrature phase detector which contains four latches as taught by Laturell et al. to modify the system and method of Izzard et al. in order to optimize the clock recovery circuitry by centering the latch function over the time of highest signal level, thereby maximizing signal-to-noise ratio (see par 0008).

Allowable Subject Matter

7. Claims 10-12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record, Izzard et al. does not teach or suggest the quarter-rate detector further comprises a second set of four latches arranged to receive the outputs of the first set of latches, respectively, and controllable to latch data at different times

Art Unit: 2611

according to the quadrature clock signals, respectively, so as to form a second set of latched signals; and the second set of four latches representing re-timed versions of the received data.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to KABIR A. TIMORY whose telephone number is (571)270-1674. The examiner can normally be reached on 6:30 AM - 3:00 PM Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shuwang Liu can be reached on 571-272-3036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Application/Control Number: 10/779,677

Page 15

Art Unit: 2611

/Kabir A Timory/

Examiner, Art Unit 2611

/Shuwang Liu/

Supervisory Patent Examiner, Art Unit 2611